DigiPlay

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1 Introduction

In most countries, an increasing amount of health issues are related to sedentariness and lack of physical activity [9, 15, 20]. The increased sedentariness can be connected to the rapid development of labour-saving technology [6, 7]. Modern technology has reduced the need for short walks interspersed in our daily lives, that were previously common. For example, now people may email a coworker, instead of taking the short walk to their desk. Additionally, new technology provides further opportunities for sedentary activities like watching TV and playing video games [1]. With these aspects combined, there is a worrying increase in sedentary behaviour in the population.

Because of this development, a lot of research in many different areas, including interaction design, explores how to encourage physical activity and reduce sedentariness. Providing easy opportunities for physical activity interspersed with daily sedentary tasks may help reduce this sedentariness, and thus improve people's health [3, 13].

One important finding is that people are more likely to participate in physical activity if they consider it fun [8]. As a result, creating interactive installations and playthings that provide a fun way to be physically active is an emerging topic within IT and interaction design. Exergames, i.e. games that require the player to physically move, are used more and more in health related fields to promote exercise in a fun way [5, 12, 18]. There are many examples of such games, as well as other installations and playthings that promote physical activity, but few of these are site-specific. Some researchers like [10] provide guidelines for designing movement-based games, or give suggestions to how to design an installation that encourages physical activity, but few discuss designing such installations for a specific place.

As such, there seems to be some gaps in the current knowledge that I wish to help fill with this project. I aim to provide a suggestion for how to design an interactive installation for a particular place. Although site-specificity is vastly utilized within art and architecture, it is a largely unexplored topic within IT and interaction design. I will also explore how to design an interactive installation that encourage playfulness, and how play motivates people to use installations that requires physical activity. To summarise, the aim of the project is to answer the question *What are some important design considerations for designing site-specific interactive installations that promote physical activity through play?* This report details a preliminary study for the project that will later answer this question.

The outcome of the project is a master thesis that suggests and discusses methods for designing site-specific interactive installations that encourage physical activity through play. Different methods from interaction design, art and architecture are combined and used in the design of such an installation. This installation will be the second contribution of this research, and is different from previous ones as it combines site-specificity with interactions encouraging playful movement. The outcome of the preliminary study is 3 concepts for possible installations, and some reflections on the process.

2 Background

2.1 Site-specificity

The term site-specific originates in art and architecture, and refers to something that is designed for a specific place. There are multiple ways this could be interpreted, and multiple ways something can be considered site-specific. Some may consider something to be site-specific if it incorporates some physical aspects of the site within its design. Others only define something as site-specific if the materials used for it come from the site. Some, like Serra [21], say that a site-specific work can only be in the place it's designed for, and that moving it would be the same as destroying it.

The physical properties of the place is not the only aspects that may be considered for a site-specific work. As Norberg-Schulz [17] describes, a place may also have social, cultural, and historical meaning. The way the place is used is important to consider when designing site-specific works.

Within interaction design, designing for a specific place is not unusual. For example, multiple projects involve making the experience of going to a museum more interactive by designing solutions for that specific museum [4, 16]. There are also some site-specific exergames and other installations promoting physical activity. Some of these will be described in the next section.

When designing site-specific exergames, certain aspects of a place affects the design more than others. The physical properties define the opportunities and constraints of the physical build of the installation. Social aspects may affect how willing people are to use the installation, and how into the game players allow themselves to get. Although the cultural and historical aspects may be important in some installations, they are usually not very guiding in the design of exergames. They should of course be thoroughly considered when designing for a place of cultural or historical significance, but are less important in other locations.

In this project, no places of cultural or historical significance will be considered for the location of the installation. The focus when designing will therefore be on the physical and social aspects of a site, with more emphasis on its physical properties.

2.2 Related work

Most site-specific work is only related to art or architecture rather than interaction design, and most exergames are made to be used anywhere. There are, however, some site-specific interactive installations that promote physical activity, and this chapter will discuss some of them. The installations discussed will be summarised in Table 1.

One of the more famous examples is the **Piano Stairs** [19]. As a way to encourage the use of stairs rather than escalators and elevators, a set of stairs in an underground station in Sweden was turned into a working piano. Each step looked like a piano key, and played the corresponding note when stepped on.

People could then play music by walking up and down the stairs, and jumping between steps that were farther away.

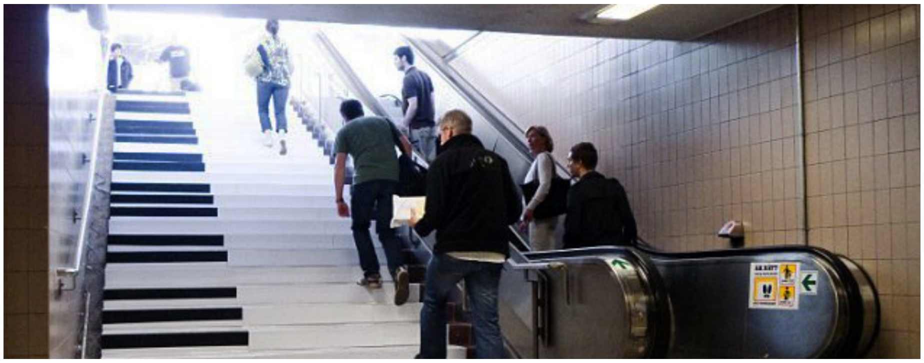


Figure 1: The Piano Stairs (picture from Peeters et al. [19])

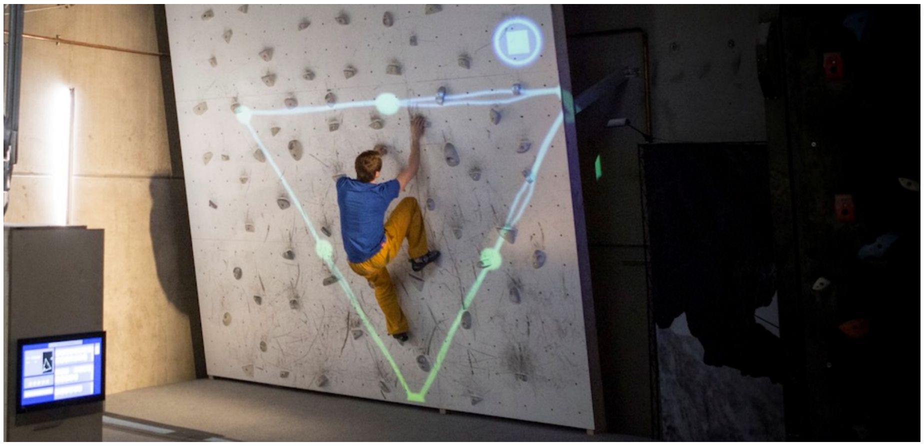


Figure 2: The Augmented Climbing Wall (picture from Kajastila, Holsti, and Hämäläinen [11])

The **Augmented Climbing Wall** described by Kajastila, Holsti, and Hämäläinen [11], provides fun, modifiable challenges for climbers. It adds games to a climbing wall, altering how the climbers use the wall. Traditionally, climbing challenges are defined by routes consisting of coloured holds attached to the wall, and the physical properties of the wall (e.g. overhang or angle to the ground). As opposed to these traditional challenges, the augmented climbing wall can easily be altered by the climbers themselves. The augmented wall provides games and challenges different from normal climbing routes, interactive features that makes it more engaging. Players can change the challenge level and the challenge type by just a few clicks.

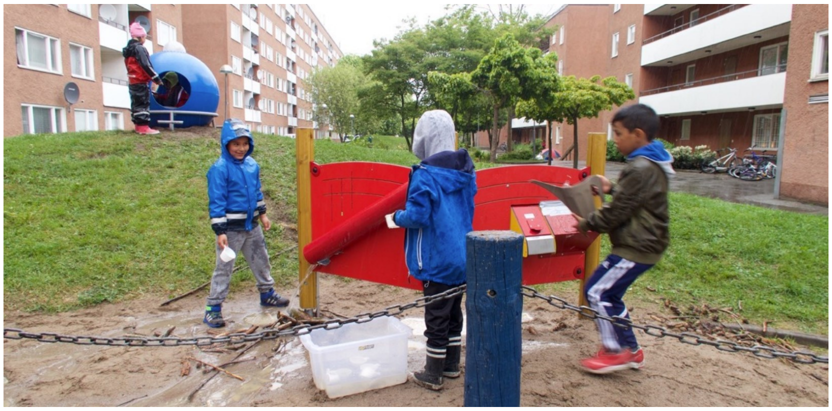


Figure 3: The Spaceship and Feeder (picture from Back et al. [2])

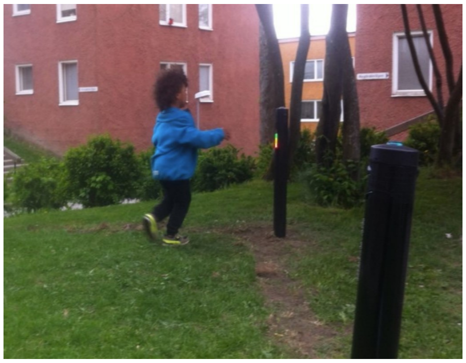


Figure 4: Part of one of the Running Tracks (picture from Back et al. [2])

Back et al. [2] talks about several interactive installations that they created to encourage children to play close to their homes. The installations mentioned are **The Short and Long running tracks**, the **Spaceship** and the **Feeder**. Another installation, the Hut, is also mentioned, but will not be discussed here as it does not promote physical activity. The running tracks consist of poles with lights and a button, encouraging children to race the light that moves from pole to pole. The feeder consists of chutes that children can feed natural materials like sand and water into, which causes lights to light up around the feeder and in the connecting spaceship. The spaceship is a small and mostly enclosed space with buttons and lights that are triggered when materials are fed to the chutes of the feeder. The children must collect materials like leaves, sand, and water from the ground and nearby area, and bring it to the Feeder. 'Feeding' the Feeder resulting in a changed state of the Spaceship also contributes to a desire for the children to run between the two so they can see the change happening. In other words, the installations provide several different activities for the children.

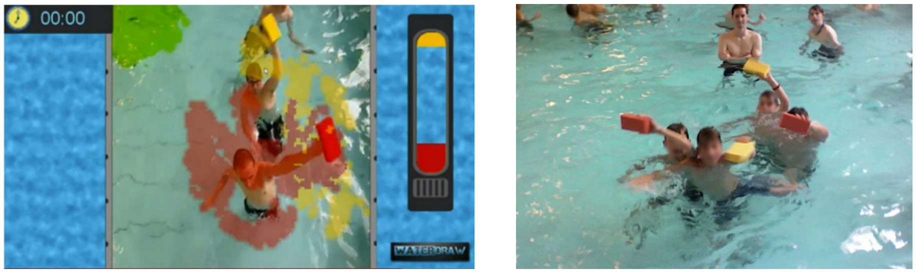


Figure 5: Screenshot from WaterDraw (left), and how it looks in the pool (right) (pictures from Sturm et al. [23])

Sturm et al. [23] also mention several installations that encourage physical activity, although only one is site-specific. How site-specific that installation is can be discussed. It was originally created to work in a pool, but can also be just outside of water. That is the **WaterDraw** installation, which allows players to draw a picture by moving coloured sponges around an area in a pool. The drawings show up in real time on a screen visible from the pool. It also has a more active competitive mode, in which the players conquer a part of the screen with their colour. The winner is the player who colours the largest part of the screen within the time limit. Balloons and bombs are placed randomly on the screen, which can help or harm a player's progress if triggered, making the game more challenging.

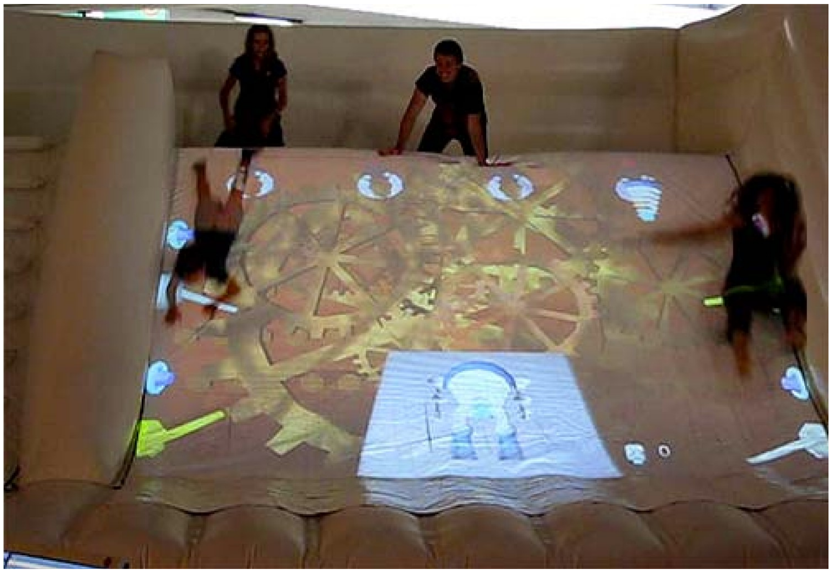


Figure 6: The Interactive Slide with the Robot Factory game (picture from Soler-Adillon, Ferrer, and Pares [22])

The **Interactive Slide** described by Soler-Adillon, Ferrer, and Pares [22] is an inflatable slide with a connected projector and camera. The projector displays images on the surface of the slide, and the camera, with the use of an artificial vision system, detects how the slide is interacted with. This provides a base for many different games and applications that encourage physical activity through the use of the slide. Soler-Adillon, Ferrer, and Pares [22] describes two such applications, the Virtual Mosaic, and the Robot Factory. The virtual mosaic consists of small squares "falling" to the bottom of the slide. When a child moves over a square, the colour of the square changes. That way, the children can create patterns and colourful mosaics by moving on the slide. The robot factory more resembles a game in which the players aim to build a robot. They do so by moving across the top of the slide to drop parts from claws, and sliding down to flick levers or stop steam valves from blowing. The applications created for the slide can be considered site-specific since they are specifically made for the slide. The slide itself can be placed at many different locations, though the technology requires an indoor space and the size requires a large space.

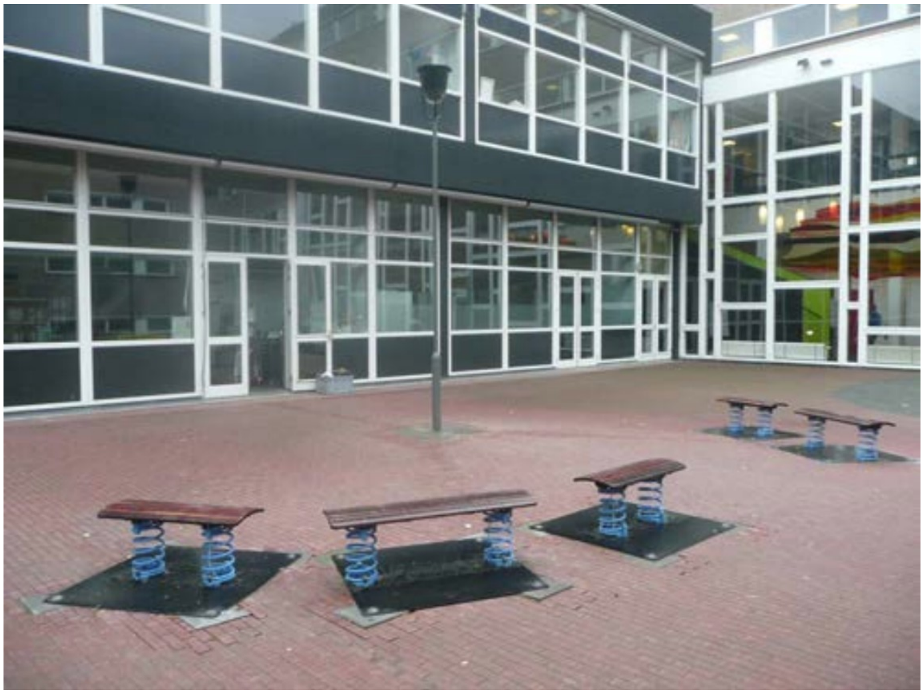


Figure 7: One of the something of the Wiggle the Eye installation in a schoolyard. The picture shows the wiggle benches as well as the central, street light being affected by the benches (picture from Soler-Adillon, Ferrer, and Pares [22])

Tieben et al. [25] created the **Wiggle the Eye** installation to encourage physical activity and social fun in schoolyards. Although the installation is created for schoolyards, it was not limited to a specific schoolyard, but rather meant to fit in many different ones. As such, the degree of site-specificity can be discussed, although the limitation to fit in a schoolyard can be considered somewhat site-specific. Wiggle the Eye consists of a set of "wiggle benches" and an interactive streetlight. Wiggling on a bench will create responses in the other benches and the streetlight. Tieben et al. [25] presents several different interaction setups with various responses to wiggling the bench, for example changing the direction of the streetlight, changing its colour, or vibrating the other benches. These will not be further described here, but provides a few different game modes intending to allow continuous exploration and discovery regarding the installation.

Previous site-specific exergame installations

Installation	**Description**	**Target users**	**Site**	**Activity /Skill**
Piano stairs [19]	An interactive staircase that looks and sounds like a huge piano	Commuters of an underground station	A staircase in said underground station	Traversing stairs
Augmented Climbing Wall [11]	Games incorporated on a climbing wall	Climbers	A climbing wall	Climbing
The Feeder and Spaceship [2]	A wall with chutes for 'feeding' natural materials into the chute, which powered lights on the wall and in the related 'spaceship'	Children	An outdoor environment between houses in a living area	Running, carrying buckets of water and other materials
The Short and Long Running Tracks [2]	Two running tracks for racing a light from pole to pole	Children	An outdoor environment between houses in a living area	Running
WaterDraw [23]	A screen that displays colours based on the movement of coloured sponges moved by people in a pool.	People in a pool	A pool	Moving through water

Installation	**Description**	**Target users**	**Site**	**Activity /Skill**
Interactive Slide [22]	An inflatable slide with interactive projections displayed on it. The projections can display a game (e.g. Robot factory) that requires the players to move across the slide, run up it, and slide down.	Children (4-8 and 10-14 yrs)	An inflatable slide, or an open indoor space	Moving across a slide, running up and sliding down
Wiggle the Eye [25]	A set of benches that shake each other and move/change the colour of a light when wiggled on.	Teenagers (12-16 yrs)	In a schoolyard	Wiggling your seat, balance, core strength

Table 1: Previous installations

3 Method

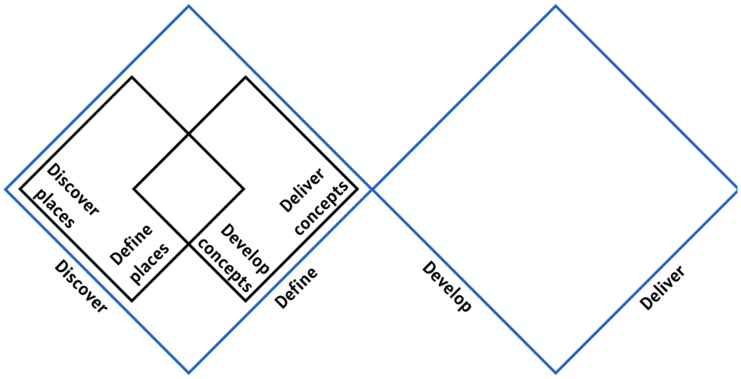


Figure 8: The double diamond

The process of this project follows an adapted version of the double diamond approach as described in *The Double Diamond* [24]. The preliminary study described in this report relates to the first diamond in the model, and also somewhat follows its own double diamond structure. The double diamond of the full project is visualised in Figure 8, and Figure 9 more clearly shows the relevant part for this report, i.e. the content of the first diamond. Each stage of this figure will be further explained when describing the part of the project that it belongs to.

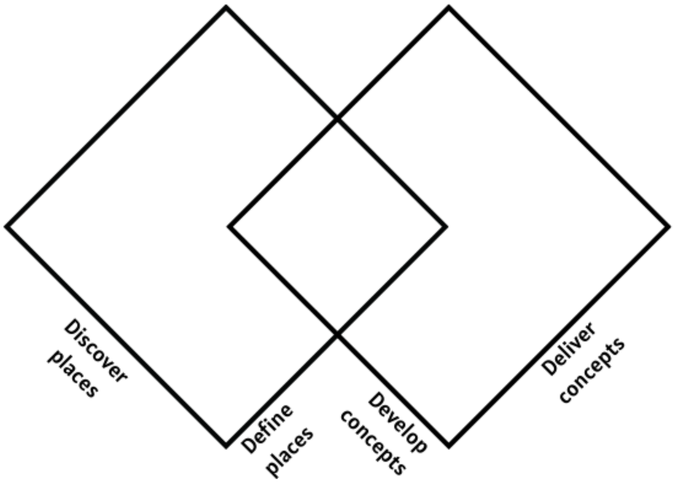


Figure 9: The part of the double diamond relevant in this report, i.e. the content of the first diamond in Figure 8.

The first step of designing a site-specific installation is to decide on the place to create it for. As such, the research started with examining different possible places. Because of limitations within the project, the only places considered are near or on campus Gløshaugen of NTNU in Trondheim. This is close to the researcher's workplace, and therefore allows going to the places to observe them often, which is important for a site-specific work. Only indoor places were considered because the testing of the installation will happen during winter. It would be difficult to get users to test the installation, as the cold would keep people from wanting to stay outside to test it. It would also introduce several other requirements for the build and materials of the installation, as it would need to withstand the cold temperatures, snow, and ice.

When first discovering places, sites were only briefly observed to see if there was something immediate that rules it out. This could be proximity to work-areas, safety equipment like emergency exits, and how much space there is for an installation. Special aspects of the space was also considered, to have something to get inspired by or utilise in the design of the installation. For example if a space has interesting column placement, a mirrored layout, or even large blank walls or floor areas.

During the observations of the space, the people residing there also had to be considered. How they use the space is important when considering where an installation can be placed. An installation should not ruin the place for the occupants, and shouldn't hinder their regular activities. Finding many possible places refers to the first part of the double diamond (marked in Figure 10).

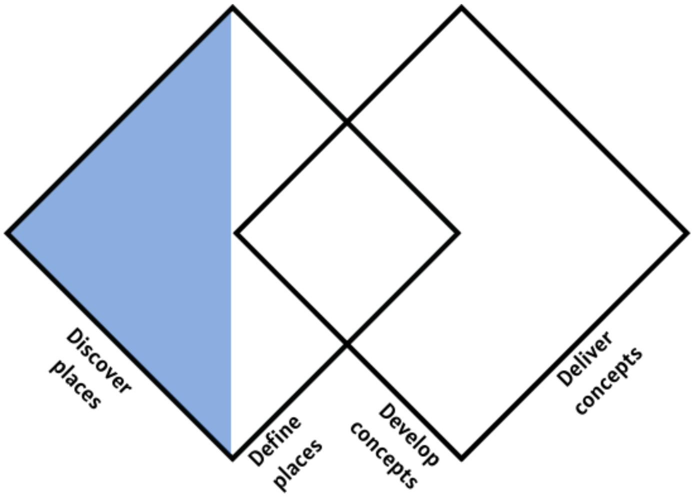


Figure 10: The first part of the project, discovering places.

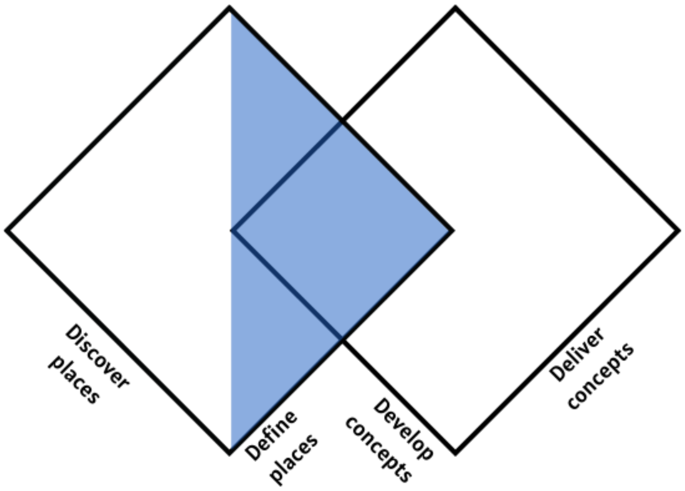


Figure 11: The second part of the project, defining places.

After getting an initial long list of possible locations, this was narrowed down through more careful observations and a more thorough set of requirements. In the model, this stage is referred to as "Define places" (see Figure 11). These requirements were

- Safety (i.e. not blocking emergency exits or other safety equipment)
- Not disturbing people working or residing in the area (i.e. not be too close to working areas or blocking areas with heavy traffic)

- Being close enough to where people are to get people to use the installation without having to go out of their way to do so, i.e. being in a place where people either spend time or pass through regularly

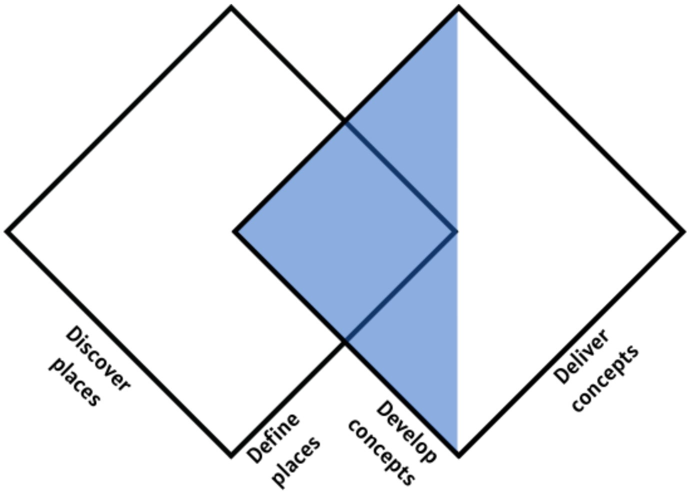


Figure 12: The third part of the project, developing concepts.

After taking all these requirements into account, two main places stood out as most promising: Hovedbygget, and Realfagsbygget. Further observations were carried out, while brainstorming for possible installations was started. This is the third stage of the project, shown in Figure 12. As the figure shows, the second and third step of the project occurred simultaneously. At first, developing concepts only included coming up with vague aspects of the space that could be utilised, and vague activities that could be performed there. These were then further developed into more concrete and multi-faceted concepts. Different activities and ways to be active was also considered, and ideas were created for all manner of skills, including speed, balance, strength, and dexterity.

When considering which ideas to further develop, input from students were taken into account. For example, some noted that they would be unlikely to use the installation if it made them sweat a lot, as that would force them to continue their day ”sweaty and gross”. A few selected students, acquaintances of the research team, took part in Wizard of Oz (WoO) prototyping. During the WoO prototyping, different ideas were tested out using everyday items to represent what the installation would provide. Items like tennis balls, rope, coloured paper, and post-it notes were used to represent lights, buttons, projections, etc. During this testing of ideas, the students were also encouraged to come up with and try out new ideas, by using the space around them and the items brought as inspiration. Several ideas were developed using this bodystorming method, explained further in Márquez Segura, Turmo Vidal, and Rostami [14].

After testing some of the ideas, the students gave input on what they liked about the ideas, and how they could be improved. These suggestions were then tested out as well. This iteration of coming up with possible improvements and testing them out was repeated for the remaining time that the students were available. After a few rounds of bodystorming and WoO prototyping, the results were collected and analysed. During the analysis, each concept was defined based on the following aspects

- **Scenario** - illustrations of how the installations could be used in a specific scenario
- **Activity/skill** - What activity is performed / what skill is being used?
- **Gameplay/rules** - What are the rules of the installation? How does a player interact with it, and what response do they get? What are the win conditions and game forløp?
- **Site** - Where is the installation placed?
- **Site-specificity** - What about this place is important for the installation? How site-specific is this concept?
- **Technology** - What technology (e.g. hardware) is used for the installation? What are some requirements of the elements used (e.g. does it need to withstand being stepped on?)?
- **Motivation** - What about the combination of site, technology, and gameplay makes the player motivated to use and re-use the installation?
- **Limiting aspects** - What might make the concept hard to gjennomføre? E.g. would it be difficult to implement in the time available? Would it produce noise that may disturb nearby study areas? Does it block any traffic? Some of the previously mentioned requirements are considered more strictly in this step.

These details are shown for some of the concepts in section 4. Not all of the concepts created are detailed in this report, but this selection shows the most important aspects considered during the evaluation.

After evaluating and documenting the most relevant concepts using the aforementioned topics, the concepts were further narrowed down to the three that were most promising for the implementation of the installation. The main considerations in this part are further detailed in section 5 and summarised in Table 2. The narrowing down of which concepts to continue with happened in the fourth and last part of the preliminary study, shown as "Deliver concepts" in Figure 13. The concepts were narrowed down to the three most promising concepts. These concepts make up the outcome of this preliminary project.

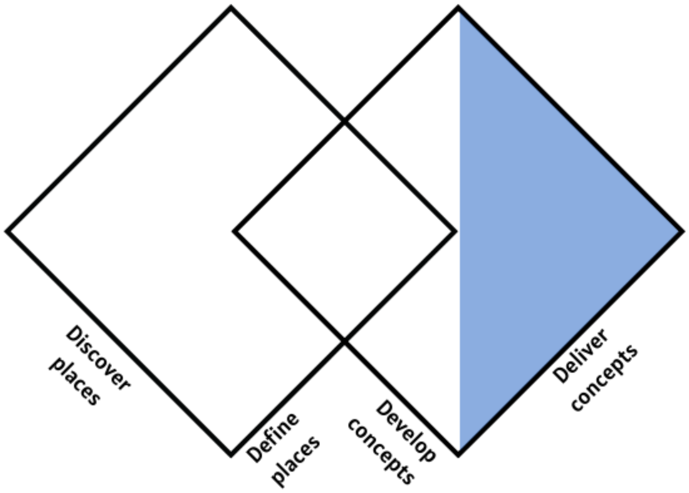


Figure 13: The fourth part of the project, delivering concepts.

4 Results

After narrowing down which places to consider, two locations seemed the most promising for the installation. These were in Hovedbygningen and Realfagsbygget.

Hovedbygningen

In Hovedbygningen, the most interesting place was the hall and connected hallways outside of the library Teknologibiblioteket. This is shown in Figure 14, and is a big, open area with many interesting properties. The space is very symmetrical, with the left and right side (looking towards the library) completely identical. It has several sets of stairs, some going along the walls perpendicular to the library, others crossing above the library, all with an identical staricase on the opposite side from it. On all the walls, there are multiple arched openings allowing view from the open area into the hallways around it, and vice versa. Above the arches at the top floor, the wall continues in an arched shape. Above the library are two rectangular sets of glass tiles on a landing between the staircases leading from the second to the third floor. It is also a relatively popular area to cross for people entering or exiting the library, but also moving between lecture halls or other rooms in the building. There is, however, rarely a heavy flow of traffic at once, which leaves lots of space for an installation. It is also a place where the people studying in the library go to take a break.

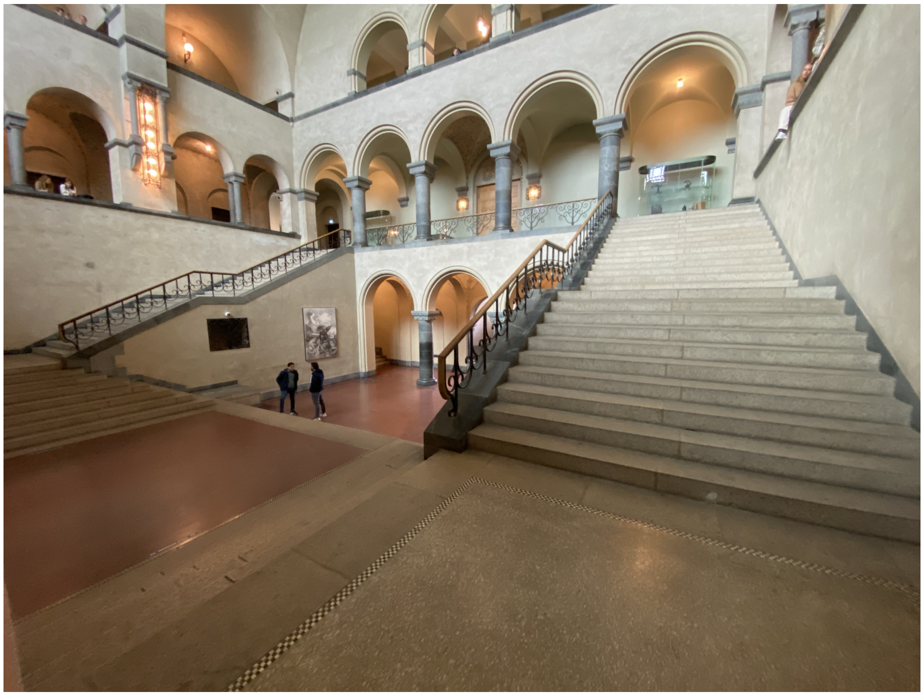


Figure 14: The hall outside the library in Hovedbygningen

Realfagsbygget

In Realfagsbygget, the area outside of the R7 lecture hall, shown in Figure 15, had the most interesting properties. It is a relatively big, open space, with a number of columns spread around. Most of the columns have a circumference of approximately an arm span, and are made of concrete. They are placed in rows with a uniform distance between most columns, though there are some differences in placement based on the requirements for the floor above, which is what the columns are supporting. Some of the columns are in a row next to the main staircase leading up to the next floor, while others follow along the walls of the nearby lecture halls, or are placed in the otherwise open area between them. In addition to leading to multiple large lecture halls, the open area also leads to multiple staircases and elevators to the other floors of the building, a hallway leading to the other rooms on that floor, and it is near an open study area. Because of this, the area is heavily populated in the time between lectures, and somewhat during other times. Most of this is traffic between the different points of interest mentioned, but some people stay in the area for longer. That is mostly people who have lectures in the nearby lecture halls, spending their mid-lecture break in the area outside of the lecture hall. In other words, there are two main uses of the area: as a place to go through to get elsewhere, and as a place to spend the lecture breaks.

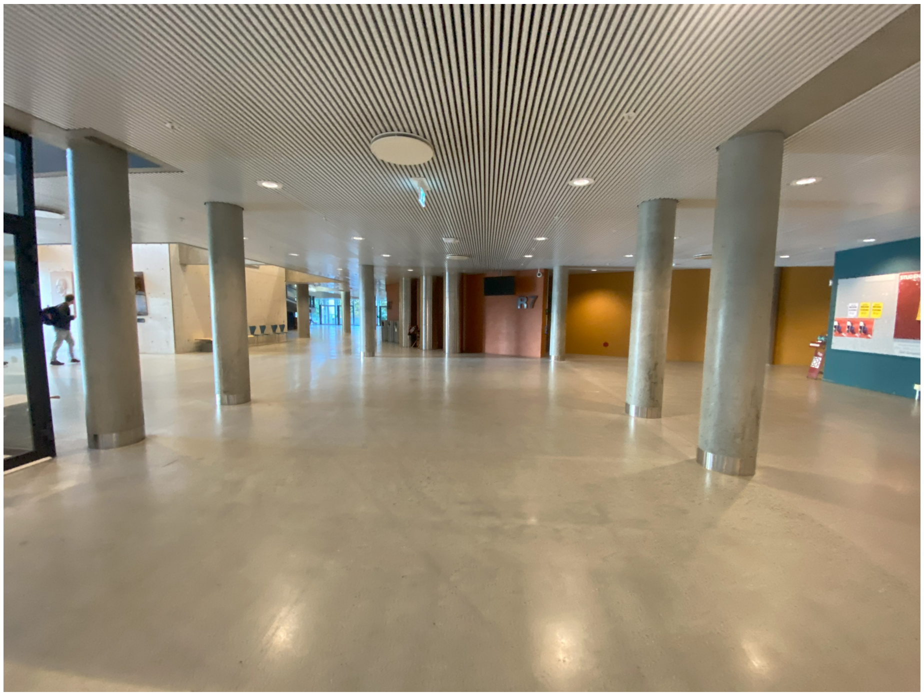


Figure 15: The hall outside the R7 lecture hall in Realfagsbygget

Based on these places, a number of concepts were developed, utilising different properties of the places. Some use the column placement in Realfagsbygget, others use the stairs and symmetry in Hovedbygningen. All considered the go-up-and-play concept, meaning that the installations should be easy to use and easy to learn how to use. The most promising concepts were defined using the following categories (explained further in section 3):

- Site
- Scenario
- Activity/skill
- Gameplay/rules
- Site-specificity
- Technology
- Motivation
- Limiting aspects

Wobbly Walk

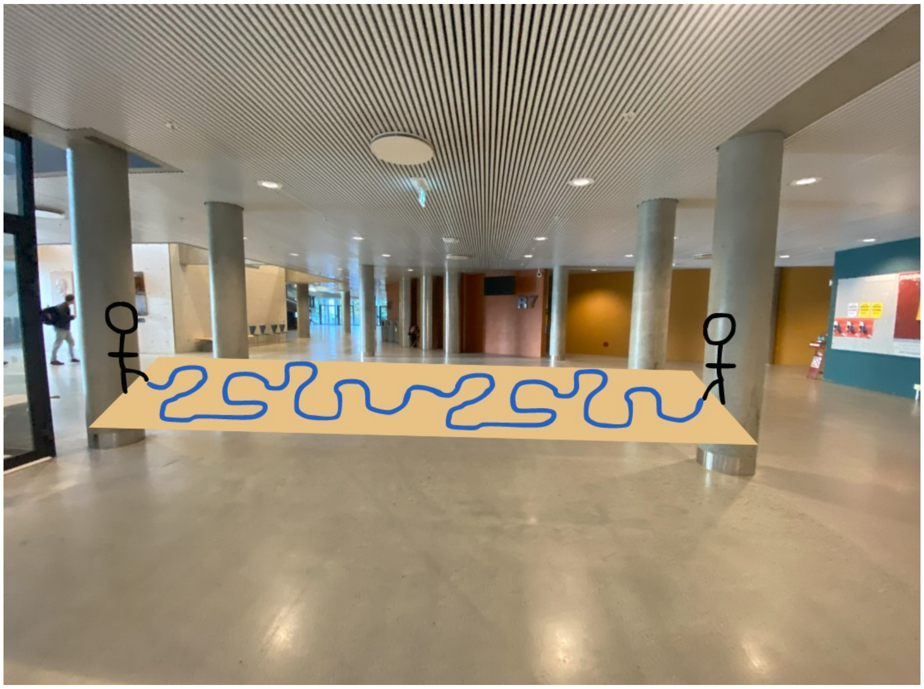


Figure 16: The site of Wobbly Walk

Site Between two columns in Realfagsbygget outside of the lecture hall R7

Activity Balance, traversing an unstable surface.

Gameplay/rules Two players stand on each end of an unstable board. A path lights up from each side, to the middle of the board The players have to collaborate on keeping the board stable and as horizontal as possible so it doesn't touch the ground. The goal is for both players to follow the lit up path to the middle of the board (or go all the way across it) without the board touching the ground

Site-specificity Between two (or four for stability) columns a suitable distance between each other for the length of the board/path.

Technology

- Individual LED lights to define the path

- A board to have the path on, that is big and solid enough for the players to stand and walk on
- Hydraulics that keeps the board suitably unstable (unstable enough to provide a challenge for the players, but not enough to be a safety hazard or make it unusable)
- Buttons to register that the players get to the end of the path
- Motion sensors to ensure that the players follow the path

Motivation Cooperating with your friend to reach a collective goal Trying out different paths (as the light change which path they should take) Figuring out how to traverse the path to keep the board off the ground

Limiting aspects Making the board stable enough to be usable and safe, but still unstable enough to provide a challenge Ensure that the players actually follow the path

Scenario

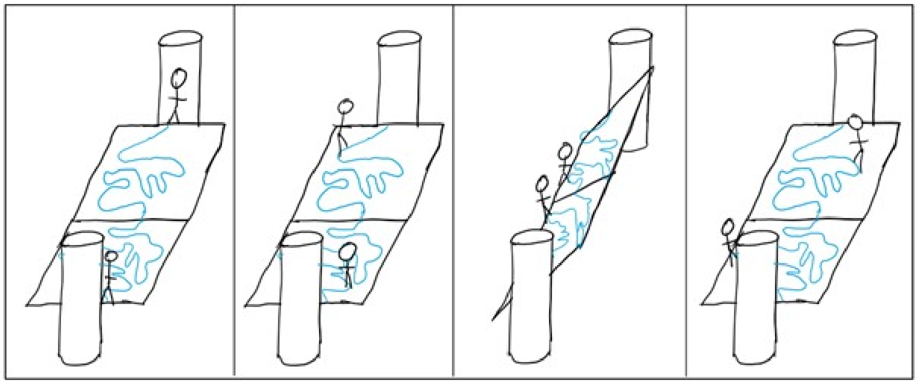


Figure 17: Wobbly Walk scenario - 1. Two players at the start of their paths. 2. The players move along the path, being on opposite sides keeps the board in balance. 3. Both players being on the same side causes the board to tilt to that side and touch the floor, the players lose. 4. On the next try, the players stay on opposite sides of the board, so it stays stable

A$^{\text{maze}}$ingLase$_{\text{r}}$

Site In "Hovedbygget", the hallway on the third floor around the hall outside the library, perpendicular to the library

Activity Agility: Move your body around obstacles. Includes bending, crawling, stepping over, and shimmying between obstacles. Speed: Trying to go past the obstacles as fast as possible.

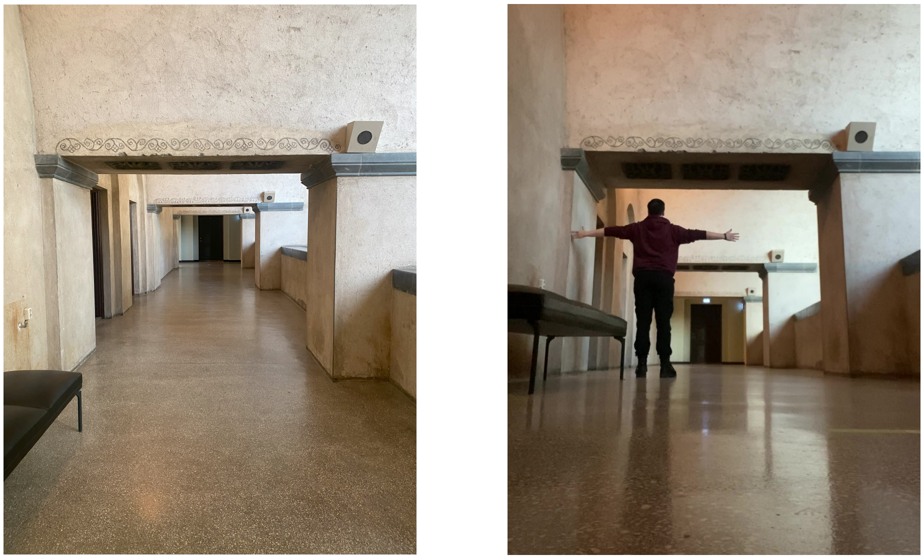


Figure 18: Amazing Laser site (1), with a person for size reference (2)

Scenario

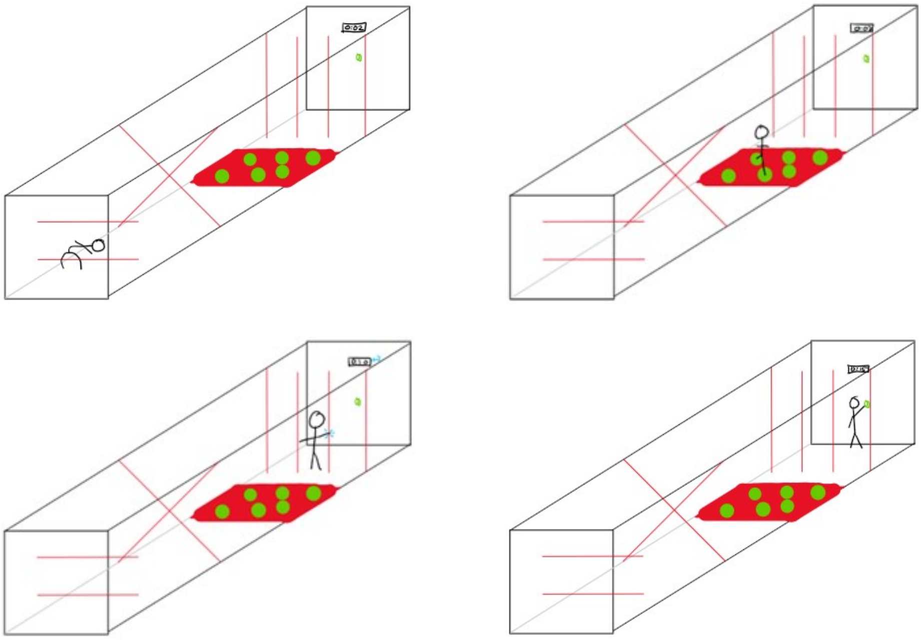


Figure 19: Amazing Laser scenario

Gameplay/rules There are "lasers", "lava floor" and other obstacles throughout the hallway, and one button in each end of the hallway that starts and stops a timer. The player has to get from one button to the other in the shortest amount of time, while avoiding the obstacles. The player gets more points the faster they are, but loses points (alternatively adds time) if they touch a laser beam or other obstacle. Can be done individually or with multiple players depending on what the players want.

Site-specificity The site is a hallway of suitable width and height for the ”laser” sensors (so they reach the entire way across), and suitable length for how long the maze should be. Is not a hallway with too much traffic, so the installation should not be very in the way of normal use of the site, and the traffic should not disturb the gameplay (i.e. someone walking through the lasers when you're playing, so you lose a lot of points because of the traffic of the site rather than your own skills).

Technology

- ”Laser” lights glow in a thin line
- Light sensors that registers whether the light is blocked by something
- A timer
- Buttons for starting and stopping the timer (should be robust enough to hit hard without breaking)
- Display for showing the time spent or score

Motivation Players being able to try out a challenge common in spy movies Trying to get through the maze faster and with fewer lasers touched Trying to figure out which route is best to take, and how to get past each laser Trying to be agile and fast, moving your body in ways you normally don't

Limiting aspects There are some doors that lead into the hallway and a little bit of traffic that may disturb the gameplay, but it should not be much of a problem. That does, however, mean that not a ton of people enter/pass the site regularly, which means that it might be a bit difficult to find users or the installation. For the installation to work properly and not be annoying, the laser lights and sensors must be properly situated (the sensor registers when a player touches the light, and only then). Otherwise people won't use it

Light Launch

Site Between 4 columns in a square in the area outside the R7 lecture hall in Realfagsbygget

Activity Move back and forth to reach the ball Speed and precision

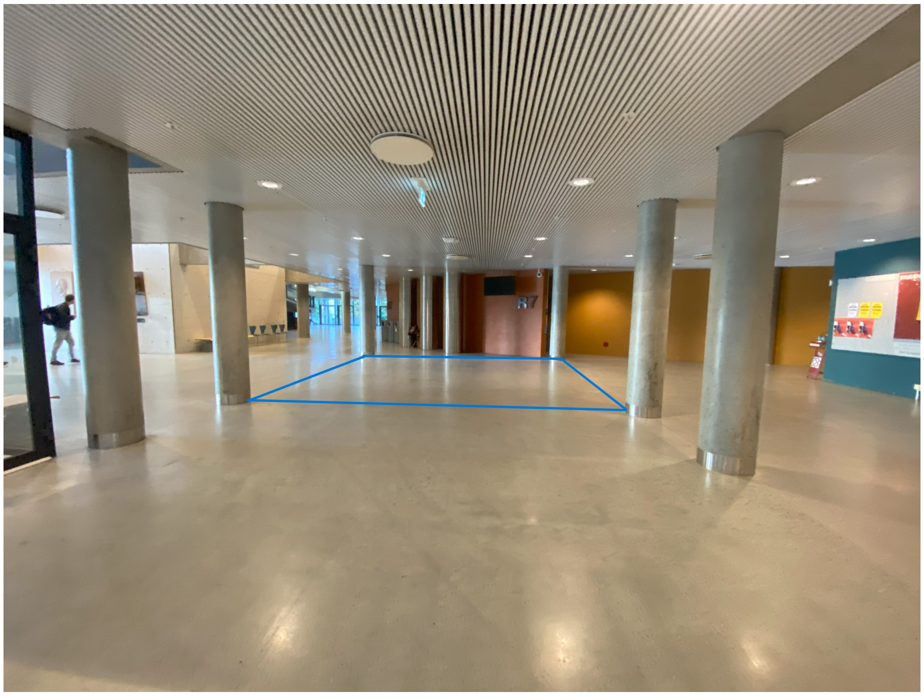


Figure 20: The site of Light Launch drawn in blue

Scenario

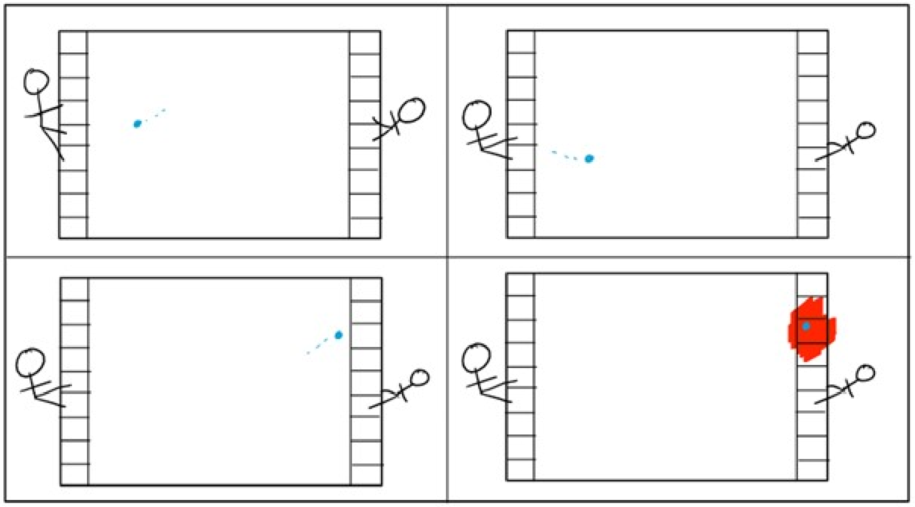


Figure 21: Light Launch scenario

Gameplay/rules To players are on either side of a square/rectangular space. A ”ball” (light?) moves across the space If the ball hits where a player is standing, is changes trajectory to move towards the other player’s side instead If the ball hits the line on which the player is standing, somewhere where the player is not standing, the other player will get a point The goal is to get the most points, or reach a certain score first

Variation: 4 players, one on each side of the square

Scenario 4-player

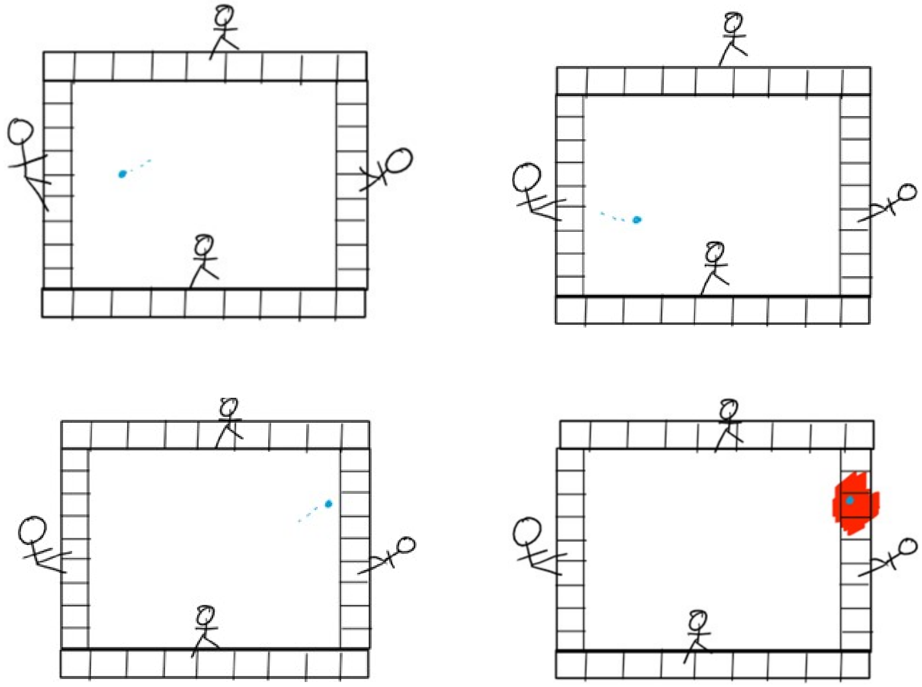


Figure 22: 4-player Light Launch scenario

Site-specificity An open square space where the players can be on two opposing sides without disturbing any traffic/normal use of the space. The 4-player variation requires a space where players can be on all four sides without disturbing the traffic.

Technology

- A set or board of LED lights that show where the ”ball” is and where it’s heading
- Buttons for the players to step on to block the ball

Motivation Try to ”catch” the light (”ball”) and win against your friend Bring a computer game to life

Limiting aspects Traffic - this would block Sensors accurately registering the movement of the players, and make the ”ball” move based on the player movement

Step Rush

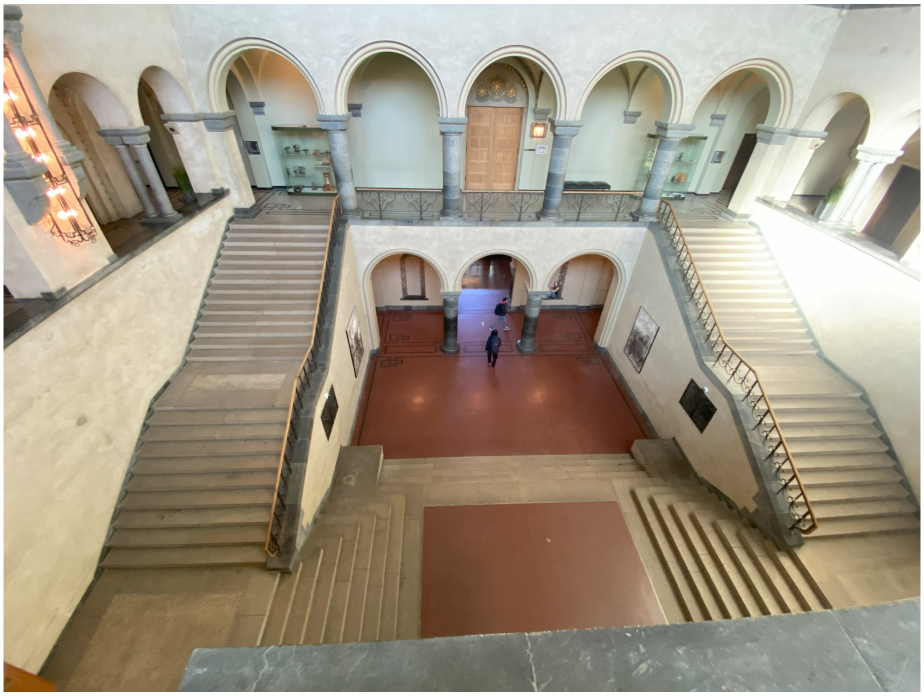


Figure 23: The stairs used for Step Rush

Site In Hovedbygget, around the hall outside the library is multiple sets of staircases. Either use the ones from the library and to the second floor, or the ones from floor 2.5 to the third floor

Activity Running up and down stairs Speed and stair-usage

Gameplay/rules

1. 2 players in a staircase each.
2. A step in each staircase lights up (same step in both staircases).

Scenario

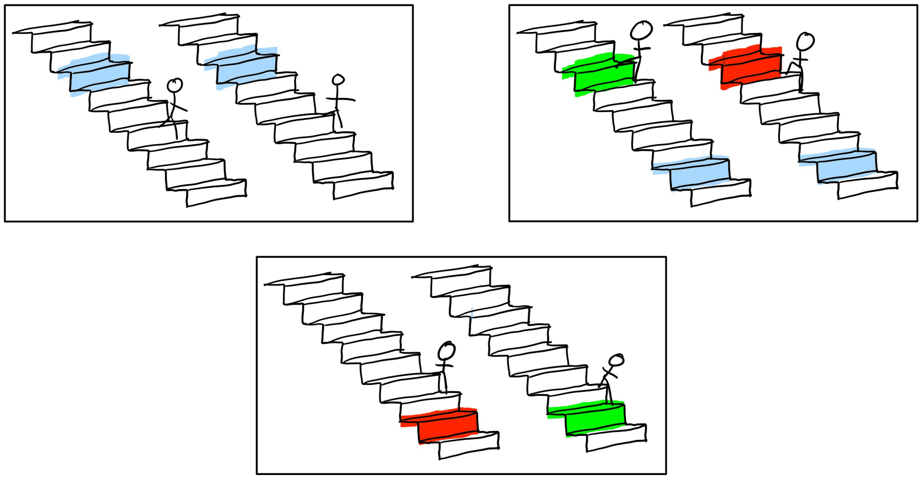


Figure 24: Step Rush scenario

3. The players run to be the first to reach that step
4. The first player to reach the step gets a point
5. Another step lights up
6. Repeat step 3-5 until one player reaches a certain score, or the players don’t want to play anymore

Site-specificity Two symmetrical staircases, where both players can easily see the other player and staircase.

Technology

- LED lights that clearly shows which step to reach
- Buttopns or movement sensors that registers when a step has been reached
- Scoreboard showing the current score

Motivation Simple rules, easy to learn fast Easy to start playing You may be curious as to why one of the steps is lighting up, and then seeing the score increase and the light move when you step on it Competing with your friend to see who is faster The stairs provide a challenge, but is very much doable, so you feel like you’ve accomplished something

Limiting aspects May be difficult to properly register when a player has reached a step, which is very important for the player experience Traffic may be a problem

Worm Wall

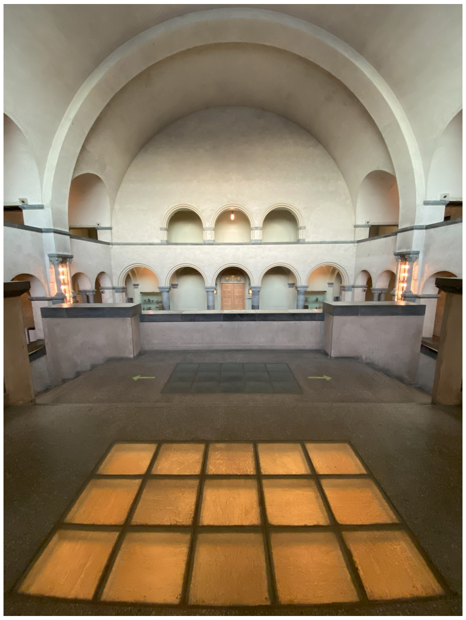
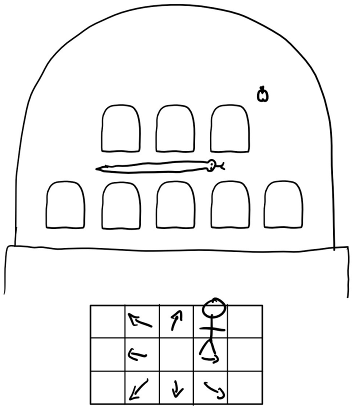
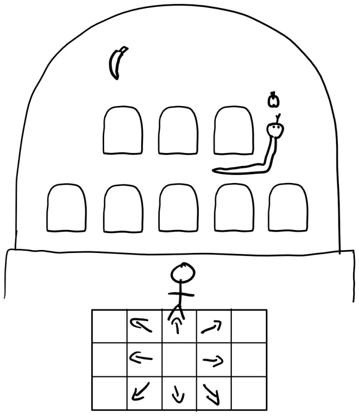


Figure 25: The site for Worm Wall

Site The set of tiles above the library in Hovedbygget, and the wall straight across from them.

Scenario





Activity Moving between different buttons/tiles Speed/timing?

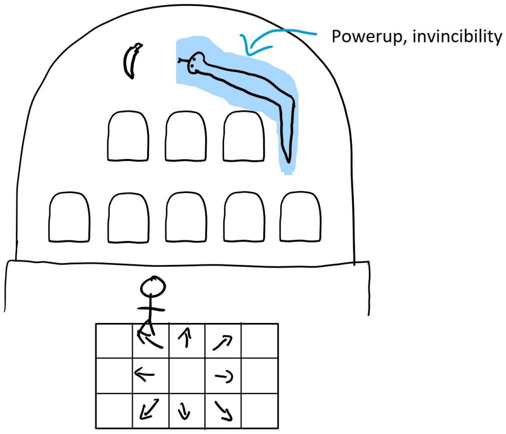


Figure 26: Worm Wall scenario

Gameplay/rules Playing the classic game snake by stepping on different tiles in order to make the snake change direction. The game will be displayed on the wall across from the tiles, and the snake must avoid the holes in the walls, in addition to the edges of the wall. Let the snake eat fruit to get powerups, and try to survive as long as possible without running into any holes, edges, or the tail of the snake.

Site-specificity The layout of the wall defines the in-game area where the snake can move, and the holes in the wall is obstacles in the game. The organisation of the tiles defines the organisation of the buttons used to move the snake. The positioning of the tiles need to be in front of the wall, but far enough away that the player can easily see everything that happens in the game

Technology

- A projector for displaying the game on the wall
- Buttons that can be stepped on

Motivation Seeing the snakes displayed on the big wall, and having to consider the actual layout of the wall within the game, makes a very interesting challenge. Moving the snake with your own movements is also a fun way to play the classic game

Limiting aspects The projector must be very carefully aligned to fit with the wall, otherwise the game will seem bugged and frustrating for the player

5 Discussion

There are many opportunities for possible concepts, but there are also many restrictions. A lot of inspected sites were discarded as possibilities because of these restrictions. This is usually because adding an installation in that area would negatively affect the usage or safety of that area. For example, many possible installation locations were discarded because an installation there would hinder escape routes, e.g. blocking emergency exits.

Apart from safety, there are still many reasons to no longer consider a possible place. Some sites have social or historical significance, which may be negatively affected by the addition of an installation. As mentioned before a place is not just the physical area, it can also have a lot of extra meaning for the people who use it.

Other areas have a lot of through-traffic, and an installation may impede this. If an area is used for, or is adjacent to, a place people usually work and need it to be quiet (e.g. a study room), an installation may be distracting and cause unnecessary disturbances to the people trying to work there. At a university, there are a lot of these areas, so many locations were discarded for this reason.

After deciding on a few promising places for the installation, many ideas were created for these places. Some ideas were just vague movements that were possible to do, specific parts of the place that was possible to utilise, or games that could be fun to implement. When trying to come up with more concrete concepts, some if these ideas were discarded. Usually it was because the idea was too vague to really be usable, or it was difficult to expand into a proper concept. Out of the ideas that were kept, some were improved by themselves, while others were combined and improved together.

In Realfagsbygget, the heavy traffic during lecture breaks and the time between different lectures provides a lot of constraints for any installation to be placed in the area. For example, it cannot occupy a large space, as that would hinder the traffic through. One should also be able to meaningfully use the installation for 15 minutes or less at a time. In other words, the gameplay should take no more than that amount of time. This is in order to cater to the constraints of the people using the area, as people generally only stay in the area during their lecture breaks. These breaks are usually 15 minutes, so that is the time people have available to use the installation.

In general, for the installation to be used, it should be easy enough to both use and learn. That means that someone should be able to just walk up to the installation, start playing, and leave when they don't want to play anymore. Because of this, the installation should not require a log-in or other pre-play processes. This requires that the installation is relatively simple.

Concept comparison

Since the goal for this part of the project was to narrow down to 3 concepts to consider for the actual implementation of the installation, some of the previously mentioned concepts has to be discarded. To properly choose which concepts to keep, all of the concepts must be properly compared. The results of the comparison is summarised in Table 2.

Concept comparison

Concept	**Creation difficulty**	**Degree of site-specificity**	**Number of players**	**Activity level**	**Safety**	**Level of hindrance of normal use**
Wobbly Walk	Difficult	Mid	2 (coop)	Mid	Hazard	Low
Amazeing Laser	Feasible	Mid	1+ (coop)	Mid	No issue	Low
Light Launch	Feasible	Low	2 or 4 (comp)	Low	Hazard	High
Step Rush	Feasible	High	2 (comp)	High	No issue	Low
Worm Wall	Feasible	Mid	1-2 (coop or comp)	Low	No issue	Low

Table 2: Comparison of possible installations

Creation difficulty in the table refers to how difficult the concept would be to build and implement within the constraints of the project. The installation must be implemented within a 2-3 month time frame. The project is conducted by a single master student, who must do most of the implementation work. Other people, like the student's supervisor and one of the professors at the design department, may help in come of the practical work, but most of the work will be done by the master student. The work load must therefore be low enough that the student have the ability to complete it. In addition to the time frame, the type of work necessary can also be a constraint. The work must be within the abilities of the student, or easy enough for the student to learn and do within the time frame while still allowing time for the other work required with the installation. In Table 2, the installations marked with Feasible in the creation difficulty column have been considered likely to be completed within the project constraints. Installations marked with Difficult are unlikely to be completed well. Because the constraints of the project are very strict, this is a very important aspect to consider when choosing which concept to continue with. Several concepts that were considered but have not been mentioned in this report were discarded because they were very unlikely to be completed within the time frame of the project.

Degree of site-specificity refers to how site-specific the installations are compared to each other. A High degree of site-specificity means that the installation has very specific requirements for the site, and would require more changes in order to be moved than most of the other installations mentioned. A Low degree of site-specificity means that the installation has few requirements for the place, and can be relocated relatively easily. Mid means that the installation has some requirements for the place, but could be relocated without too much trouble. Because the goal of this project is to discuss methods for designing site-specific installations, this is an important aspect to consider about the conseepts.

Number of players shows how many players the installation is made for. For multiplayer installations, it is also specified whether the installations is meant to be cooperative (coop) or competitive (comp).

Activity level refers to how active the installation requires the players to get. A High activity level means that the players are quite active. Several different skills must be used (e.g. speed and endurance), and the players are likely to get a bit out of breath. A Low activity level means that the installation only requires a little bit of movement, e.g. small movements over short distances. Mid means that the installation requires some movement, but is unlikely to bring the players to exertion. It may also focus on skills like balance or agility that are less likely to make the players out of breath. The level of physical activity is also important to consider because it is a goal of the project.

Safety is an important concern in multiple ways. The installation should not provide an unsafe environment where players are likely to get injured. It should also stay out of the way of safety equipment and emergency exits, to not provide a safety hazard for the people in the surrounding space. The installations marked with No issue in the table provide no major safety concerns. The installations marked with Hazard may cause some issues. Light Launch would occupy a relatively large area, and would be blocking emergency routes. Although it would not directly block an emergency exit, it would be a bottle neck on the way to emergency exits, and may cause a hazard. Wobbly Walk may be a safety issue for the players. Since the board is unstable, there is an increased risk of falling. It is also above the ground, increasing the consequences of falling. Some of these risks could be mitigated by making the board more stable and closer to the ground, but that would reduce the challenge and fun of the installation. Finding a decent middle ground would be challenging.

Level of hindrance of normal use refers to how much an installation would disturb the current use of the place. This could be by blocking traffic, causing more noise than the normal use, or otherwise making it difficult to use the space like it is currently being used. The installations marked with Low in the table provide little to no such disturbances. They are easily bypassed without causing a bottle neck, and don't cause much commotion. Installations marked with High would cause a significant change in the current usage of the space. Light Launch mainly does this by blocking traffic.

6 Concluding remarks and future work

From the considerations presented in the discussion, the relevant concepts have been narrowed down to 3. These concepts are Step Rush, Worm Wall, and A$^{\text{maze}}$ingLase$_{\text{r}}$. The next part of the project will consist of further narrowing down to only one concept that will be implemented. A prototype for that concept will then be made, tested, and altered in multiple iterations in order to improve both the prototype and the concept itself. When a sufficiently complete and robust version has been made, it will be thoroughly field tested over a 2-3 week period. During this period, the installation will be stationed at the site it's designed for, and tested by the people residing in said place, i.e. the real users. The usage of the installation will be observed and documented, and users will be interviewed to further understand their perception of the installation. The results from the observations and interviews will be analysed, and the findings will be presented in a master thesis.

The most important findings from the current stage in the project is that there are many aspects to consider when designing site-specific interactive installations. The amount and routes of traffic in the area can significantly restrict the possibilities for installations. A site-specific installation should integrate well with the environment, and not hinder the current usage of it. One must also properly consider the safety of possible installations. Both in terms of not blocking safety equipment and emergency exits in the space around the installation, but also in regards to the installation itself. The installation should not provide much risks for users to get injured either. With installations requiring physical activity that are based on the site in which they're situated, safe usage of the installation must be thoroughly considered. For example, elevated installations like Wobbly Walk may cause injuries if users fall off of it. This should be considered, and the risks should be reduced wherever possible. Another aspect to consider when designing site-specific installations is how site-specific it actually is. Although it may be designed with a specific place in mind, many installations could easily be moved elsewhere with little to no change in the installation. In other words, there are many different aspects that must be considered.

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